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**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*).
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## CLAIM + DETAILED DESCRIPTION

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**[Claim(s)]**

[Claim 1] The carbonization method by the overheating steam characterized by making the processed material which is going to carbonize overheating steam of abbreviation normal pressure of 300 degrees C or more contact, and carbonizing a processed material.

[Claim 2] The carbonization method by the overheating steam characterized by using an auxiliary heating means to raise the temperature of said processed material, in the carbonization method by overheating steam according to claim 1.

[Claim 3] The carbonization method by the overheating steam characterized by burning the gas produced by carbonization of a processed material with a melting furnace, and detoxicating it in the carbonization method by overheating steam according to claim 1.

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**[Detailed Description of the Invention]**

[0001]

[Field of the Invention] This invention relates to the carbonization method of using overheating steam for carbonization of food waste etc.

[0002]

[Description of the Prior Art] There is the method of carrying out combustion processing as one method of processing the conventional, for example, food, waste. Salt and other ingredients are included so much, if it burns, chloride will be made, and it becomes impossible however, for piping of equipment etc. to use it for example, in the case of soy sauce strained lees, being corroded for a short period of time. Although what is necessary is to wash and just to remove salt etc., in order to avoid this, BOD of drainage serves as size and is troubled by processing of the drainage. According to the experiment, 1600 (mg/l) and T-N (the amount of total nitrogen) are set to 170 (mg/l), and, as for the water which 5-time-as many water as this was made to distribute soy sauce strained lees by weight, and filtered this through filter paper, BOD exceeds greatly the maximum (BOD is 160 and T-N is 120) of restriction by Water Pollution Control Law. Then, carbonizing within a predetermined division is thought as another method. If it carbonizes, it minerals-izes, even if volume decreases and washes, processing of drainage will become easy, and moreover it will wash, and will be made to what can be used effectively. As for carbonization, calling at a carbonization furnace is common. A general carbonization furnace is heated

with a burner etc., where air is intercepted, and it is roasted in a covered pan. In this case, it will heat at a fairly high temperature and there are many amounts of bursts of buying, and carbide is high temperature when carbonization is completed, and being cooled radiationally with air intercepted is common [ carbide ]. This is not desirable in respect of effective use of heat.

[0003] Moreover, although there are some which use water vapor in the conventional carbonization furnace independently, a degree of superheat is low and the water vapor used is heating by saturation water vapor. In order to obtain 300-degree C steam by a boiler etc., the pressure of 8.59MPa is needed. If pressure becomes high, also in a container, a pressure vessel will be needed and equipment expense will become immense.

[0004]

[Problem to be solved by the invention] This invention makes it a technical problem to offer the carbonization method by steamy heating without using a pressure vessel.

[0005]

[Means for solving problem] The means of this invention is characterized by making the processed material which is going to carbonize overheating steam of abbreviation normal pressure of 300 degrees C or more contact, and carbonizing a processed material (Claim 1).

[0006] According to the experiment by the inventors of this invention, a processed material [ some predetermined temperature within the limits of 200-400 degrees C ] When what was placed into the saturation-water-vapor atmosphere of the pressure from which the same time and said predetermined temperature are obtained was compared with the thing placed into the overheating water vapor atmosphere of normal pressure, although placed into overheating water vapor rather than what was placed into saturation water vapor, it turned out that carbonization advances more mostly at temperature with a low direction. The means of this invention is based on the result of this experiment. As for steam of abbreviation normal pressure of 300 degrees C or more, an abbreviation degree of superheat is 200degreeC, and when a degree of superheat is more than 200 degreeC, an effective carbonization operation is accepted. Therefore, steam of abbreviation normal pressure is used, and it is a lower temperature and can carbonize.

[0007] In said means, it is good to use an auxiliary heating means to raise the temperature of said processed material (Claim 2). With this composition, in order to heat the processed material of normal temperature to 300 degrees C generally, it is not necessary to use overheating steam. Since the quantity of heat which overheating steam holds, and the container temperature which has accommodated the processed material from few things at the standup time of a processing unit are low [ the way which applies auxiliary heating by the electric heater which supply quantity of heat can be enlarged and is easy to adjust supply quantity of heat again, a fuel combustion burner, etc. ] in order to maintain raising not only a processed material but the temperature of the circumference of it, and its temperature It is because it is advantageous at the point which seldom haves to enlarge capability of an overheated steam source of supply. That is, it is because it is advantageous at the point which does not have to be made so large that meals are provided to the quantity of heat which raises a processed material even to carbonization temperature, or the quantity of heat which raises ambient temperature. Moreover, if steam once becomes water, considering the case where the processed material of a low temperature is heated only with overheating steam and it becomes water, since it will adhere to a processed material, the moisture will be again made into steam and it is very inefficient.

[0008] In said means, it is good to burn the gas produced by carbonization of a processed material with a

melting furnace, and to detoxicate it (Claim 3). [ this composition / the gas produced by carbonization of a processed material ] If it supplies in the melting furnace which there are many possibilities of doing bad smell pollution on the outskirts when many bad smell ingredients are included and it emits into the atmosphere as it is, although it changes also with processed materials, and is suitable for processing of dioxin content waste at the processing and is made to burn Since it is high temperature (about 1200degreeC), it is decomposed certainly and a bad smell ingredient serves as no odor. Moreover, there is also no fear of dioxin generation.

[0009]

[Mode for carrying out the invention] The form of 1 operation of this invention is explained using drawing 1 . The carbonization equipment 1 of drawing 1 is used for implementation of the carbonization method of this invention, for example. Carbonization equipment 1 consists of the overheating steam source of supply 2, the carbonization furnace 3, water washing equipment 4, and gas treatment equipment 5 grade. The overheating steam source of supply 2 sends out the steam generated with the steam boiler 10 as overheated steam with the steamy overheating machine 11, as shown in a sketch.

[0010] The carbonization furnace 3 prepares the feed opening 13 of overheating steam from said overheating steam source of supply 2, the processed material entrance slot 14, an auxiliary heating means 15 to heat and to hold the inside of a compartment 12 to a predetermined temperature, the carbide outlet 16, and gas sending-out mouth 17 grade in the compartment 12 divided from the external world. The auxiliary heating means 15 applies the usual electric heater, an electromagnetism warmer, a fuel combustion burner, etc.

[0011] Water washing equipment 4 can wash with water what was carbonized at the carbonization furnace 3, separates the thing and drainage which were carbonized, and has the flush tub 18, carbide extraction equipment 19, and waste water treatment equipment 20 that what is necessary is just what can process drainage. In almost all cases, waste water treatment equipment 20 requires only a filter, but when it is necessary to remove salts, what can perform the processing is prepared.

[0012] [ gas treatment equipment ] although gas treatment equipment 5 is equipment which was generated by carbonization of the processed material in the carbonization furnace 3 and which mainly carries out detoxication processing of the gas sent out from the gas sending-out mouth 17 If emission gas temperature falls below to 100 degrees of \*\* C, since steam will become water, the ingredient and the water-soluble ingredient which were liquefied similarly will be contained in the water and a liquid will separate into abbreviation nature, it has the container 21 for recycling which collects these, and a deodorization means 22 to remove a bad smell ingredient or to decompose. Although the deodorization means 22 is good to supply in a hot furnace, to make it burn, and to decompose a bad smell ingredient, about exhaust gas with a possibility of generating dioxin including chlorine, it is most appropriate to supply and decompose into the melting furnace in the processing unit of the waste containing dioxin. About a thing without fear of generation of dioxin, the thing of composition of adsorbing a bad smell ingredient or the thing to decompose at high temperature is applied. In the compartment 12 of the carbonization furnace 3 of \*\*\*\*\* and this carbonization equipment 1, although the division is carried out by the interior wall, the inside of gas treatment equipment 5 is abbreviation atmospheric pressure, and the inside of the carbonization furnace 3 is also an abbreviation atmospheric pressure grade.

[0013] [ the method of this invention which uses the carbonization equipment 1 of drawing 1 ] For example, if the case where the strained lees of soy sauce are carbonized is explained, the soy sauce strained lees of a processed material will be thrown into the carbonization furnace 3. It heats so that a

processed material may become a predetermined processing temperature with the auxiliary heating means 15, and overheated steam of 350 degreeC from the overheating steam source of supply 2 is supplied in the stage to which the processed material reached an approximately predetermined processing temperature, for example, 350 degreeC, and the state is continued for 30 minutes, for example. While carbonization is performed in the meantime, and supply of overheated steam is stopped after progress of this time and the auxiliary heating means 15 is operating, this is also stopped, and carbonization of a processed material is completed. After moving the carbonized processed material to the flush tub 18 and washing, it takes out with carbide extraction equipment 19, and the water used for the flush is processed with waste water treatment equipment 20, and is discharged to a river. It deodorizes with the deodorization processing means 22 of gas treatment equipment 5, and the exhaust gas which comes out of the gas sending-out mouth 17 is emitted into the atmosphere. When a processed material is wood quality, in the case of that whose woody material is materials, most of the liquid with which the container 21 for recycling is covered is pyroligneous acid.

[0014] [ this method / carbonization of various kinds of solid organic matters ] by using overheating steam It is possible at a temperature lower than the case where saturation water vapor is used, and strained lees of a seed or fruits, wood waste (a sawdust, a wood chip, etc.), a useless article of a paper product, RDF (it is what charge[ of revival ]-ized garbage, and the waste of a plastic is included), etc. other than the strained lees of soy sauce are mentioned, for example. Moreover, soil improvement material, adsorbent, fuel charcoal, etc. can be used for the obtained carbide in many fields, for example. Moreover, pyroligneous acid can also be used as a medicine for horticulture. In addition, according to the experiment, the water which washed with weight the carbide which carbonized soy sauce strained lees with heating steam of 300 degreeC with 5-time-as many water as this, and filtered the water through filter paper can clear the maximum of restriction by Water Pollution Control Law which 11 (mg/l) and T-N were set to 2.9 (mg/l), and BOD described above.

[0015]  
[Working example] About carbonization of this invention, it proves by overheating water vapor and saturation water vapor by the experimental result which explains below that to be based on overheating water vapor may be [ carbonization temperature ] lower. What divided the strained lees of the soy sauce as a processed material into 200g at a time is used. After holding for 30 minutes at 200, 250,300, and each temperature of 350 or 400 degrees C in overheating water vapor atmosphere and saturation-water-vapor atmosphere, the carbonization situation was judged by viewing and the minimum temperature which 200g of all carbonize was investigated. This result is shown in Table 1.

[0016]  
[Table 1]

蒸気の種類	炭化温度(° C)				
	200	250	300	350	400
飽和水蒸気	×	×	△	△	○
過熱水蒸気	×	△	◎	◎	◎

[0017] The rate which has been judged and carbonized visually (black-izing) and which is carried out x mark in front Less than 10%, The rate which the rate which the rate which judged \*\* mark visually and has been carbonized (black-izing), and which is carried out judged O mark visually 10% or more of less than 50%, and has carbonized (black-izing), and which is carried out judged O mark visually 50% or more of less than 90%, and has been carbonized (black-izing) and which is carried out shows 90% or

more. As shown in Table 1, in saturation water vapor, 50% or more carbonizes above 400 degrees C, but in the overheating water vapor applied by this invention, almost all carbonization is progressing above 300 degrees C. Therefore, the way of heating by the overheating water vapor which this invention applied, i.e., heating in overheating water vapor atmosphere, can carbonize at a temperature lower than heating by saturation water vapor. As this Reason, it is considered to have influenced greatly that steam is being activated by overheating.

[0018]

[Effect of the Invention] Since the invention according to claim 1 can stop the quantity of heat to consume low since a processed material can be carbonized at a comparatively low temperature, and it is good without using a high-pressure container, production costs and a maintenance cost do so the effect which may be that it is easy to manufacture equipment. Invention according to claim 2 does so the effect which seldom have to enlarge capability of an overheated steam source of supply. Invention according to claim 3 does so the effect that bad smell pollution can be prevented.

## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the composition figure showing the composition of the outline of the carbonization equipment used for operation of the method of this invention.

[Explanations of letters or numerals]

- 1 Carbonization Equipment
- 2 Overheating Steam Source of Supply
- 3 Carbonization Furnace
- 4 Water Washing Equipment
- 5 Gas Treatment Equipment
- 10 Steam Boiler
- 11 Overheating Machine
- 12 Compartment
- 13 Feed Opening
- 14 Processed Material Entrance Slot
- 15 Auxiliary Heating Means
- 16 Carbide Outlet
- 17 Gas Sending-Out Mouth
- 18 Flush Tub
- 19 Carbide Extraction Equipment
- 20 Waste Water Treatment Equipment
- 21 Container for Recycling
- 22 Deodorization Means

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[Translation done.]